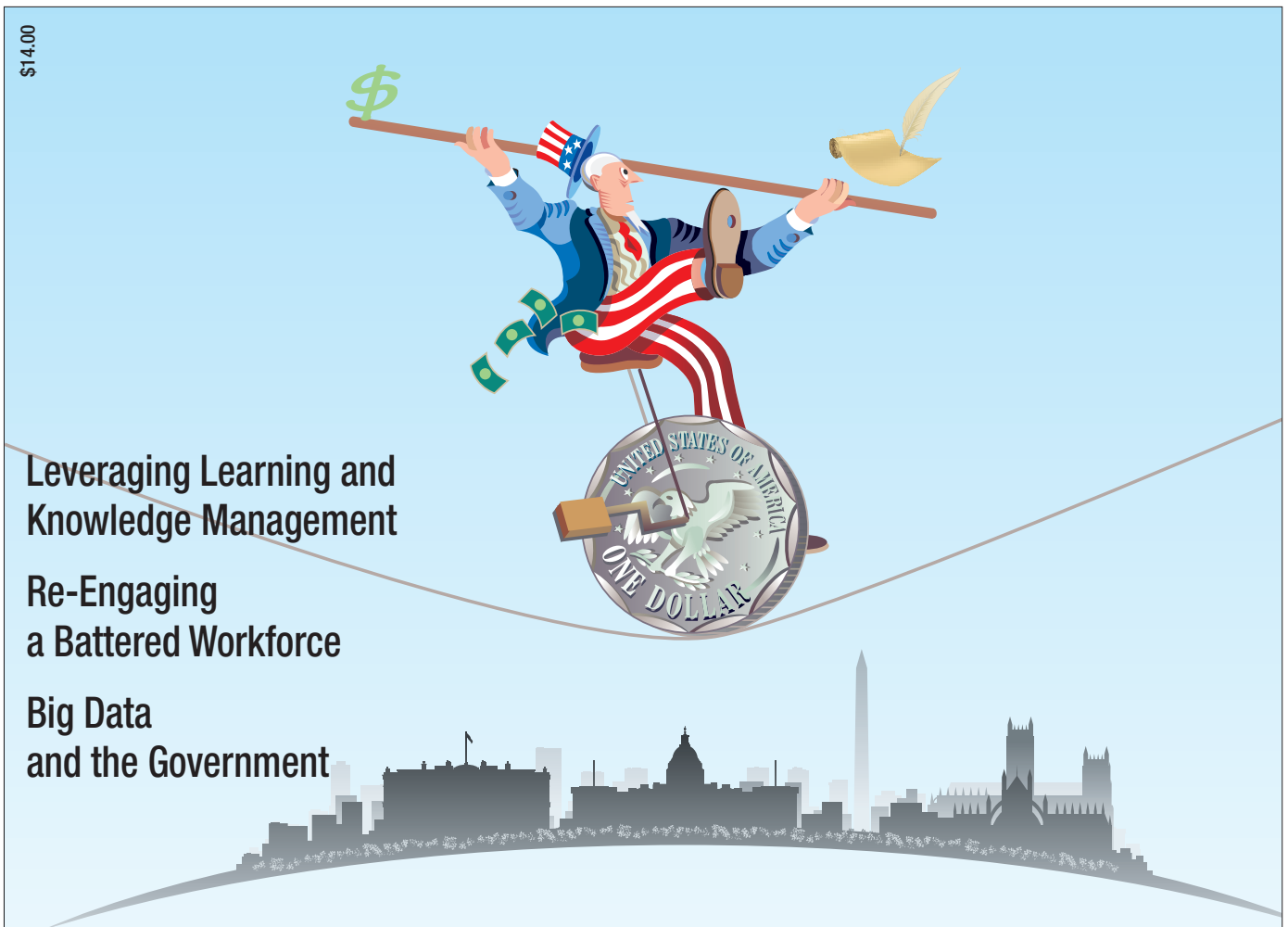


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Big Data and the Government Agency

by Stacey Shindelar

A look at how three federal agencies manage Big Data in the wake of a White House document outlining a four-layer digital structure through which data can be amassed, organized, and presented.

Today's societies run on information. Data are the fuel that powers government agencies as well as private sector organizations. The proliferation of data over the past few decades has dramatically increased in volume, earning the designation Big Data.

Big Data is more than just a collection of random facts and figures, however. Structuring and organizing the data can benefit individuals and organizations in ways that were inconceivable in the past. Government agencies can use the latest technology to harness the power of Big Data to enhance their performance, better serve the citizens of the United States, and stay within their budgets.

Big Data can help them access and consolidate more information at a lower cost. This can expose and eliminate redundancies and inefficiencies and can identify and serve core populations. Big Data has the potential to make government better. (See the winter 2013 issue of *The Public Manager* for Forum: Connecting Data to Manage Performance.)

Government agencies using Big Data to increase their service capabilities include the Department of Housing and Urban Development (HUD), the Federal Emergency Management Agency (FEMA), and the National Oceanic

and Atmospheric Administration (NOAA). Their examples can spark ideas for other agencies to use Big Data to serve needs common to all areas of government, as well as to the unique requirements of each department.

Four Areas of Big Data Structures

Government agencies serve their employees, other organizations, and the general public. All audiences must be able to access and use data pertinent to their concerns. Agencies also must provide this information across a variety of platforms, including various types of computer operating systems, Internet service providers, online applications (including social media), notebooks and e-readers, and smartphones. Digital data are a driving concern when considering the ways consumers access the information made available by government agencies.

In 2012, the White House published a document outlining a four-layer “conceptual model” for a digital structure through which data can be amassed, organized, and presented to consumers. The model (see Figure 1) contains an “informational layer,” in which digital data are collected; a “platform layer” that addresses “all the systems and processes” needed to manage the data; a “presentation layer” that organizes the data and decides the methods through which they will be presented to users; and, finally, the “security and privacy” considerations that must be put in place so that users are protected when they access and interact with the data. The model designates these layers as “information-centric [and] customer-centric,” with approaches that utilize “shared platforms” and provide users with the assurance of “security and privacy.”

These elements are further explained below, along with examples of how HUD, FEMA, and NOAA are using the digital strategy model to organize and present Big Data to consumers.

Information-Centric Movement

In the past, government agencies usually offered information to their audiences in single documents or in a series of documents. Today, digital technology allows interrelated data to be collected and easily accessed through various devices. Furthermore, data presentation is not limited to single-purpose documents.

The White House report of 2012 states that today’s “discrete pieces of open data and content . . . can be tagged, shared, secured, mashed up, and presented in the way

that is most useful for the consumer.” Collecting, validating, organizing, and structuring data are primary in this approach, in contrast to a focus on the final method of presenting the information. Agencies are using the standards of this approach to serve customers, whatever their needs may be.

Department of Housing and Urban Development

According to HUD’s 2013 Digital Strategy report, the agency’s information-centric approach “decouples information from its presentation” using “web application programming interfaces,” or APIs. This approach allows for greater flexibility so that data can be updated and changed as needed without being tied to a particular form of presentation.

Removing the need to reproduce presentations in different formats reduces duplication of effort and thus reduces cost. HUD adopted the integration approach as part of its Big Data strategy, which concentrates on financial management, cost savings, and the achievement of optimum efficiency. This approach allowed HUD to create a strong architecture, which is readily available to other agencies.

HUD’s strategy is based on using information technology (IT) to make major corporate decisions. Furthermore, it connects HUD to other agencies, bringing help in formulating new policies, guidelines, and strategies, and in sharing information and resolving problems. Business intelligence and Big Data strategy aims at delivering capabilities, managing resources and service planning, and focusing on performance management and customer management.

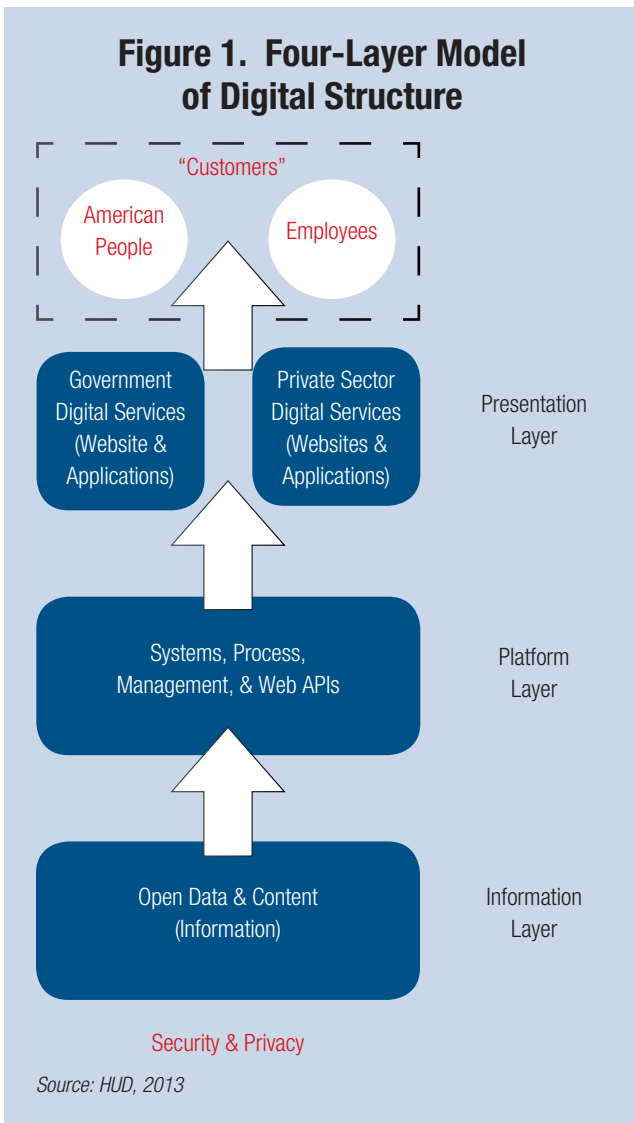
Federal Emergency Management Agency

The need for information is critical following a natural disaster, which was amply illustrated by Hurricane Sandy. Data pour in from numerous sources, in many formats. The ability to organize and disseminate this information within FEMA, and to other relief organizations, the government, and the public in the most efficient manner possible is critical.

In addition, FEMA has a specific need for geospatial representation, so that users can access visual as well as textual information. FEMA and other federal organizations integrate Big Data and IT to manage disasters and make decisions that save lives.

FEMA’s approach uses modern sensors together with social media to provide services to citizens. FEMA

Figure 1. Four-Layer Model of Digital Structure



also uses geographic information systems (GIS) mapping. The agency collaborates with different national organizations, such as U.S. Geological Survey, and shares data with these organizations to predict and manage disasters.

In the case of Hurricane Sandy, FEMA acquired more than 150,000 photos, which were created by GIS mapping by the Civil Air Patrol. These images improved organizational efficiency and disaster management planning by identifying target areas, detecting structural damages, and providing assistance to survivors.

National Oceanic and Atmospheric Administration

NOAA deals with “untold petabytes of data” as part of its mission to track and research the climate, oceanography, and weather, according to J. Nicholas Hoover in his 2013 article “NOAA CIO Tackles Big Data.” For example, the 2011 earthquake off the coast of Japan involved “using

Removing the need to reproduce presentations in different formats reduces duplication of effort and thus reduces cost.

real-time data from ocean sensors” as well as a multitude of existing data to “[generate] computer models of the tsunami to follow.”

NOAA receives constant streams of data that must be pulled together and presented to federal, state, and local governments, as well as to the private sector. Everything from local weather forecasts to long-range environmental planning depends on this data.

Sensors have been installed at different locations including buildings and bridges. Surface-buoy and the sea-floor pressure sensors at the bottom of the ocean allow NOAA to collect data and have the ability to report sea-level variations in real time to monitor and predict weather changes. These buoy and sensor technologies provide data to the agency, which uses them to create models predicting weather conditions. Hoover estimates that NOAA collects some 80 terabytes of data on a daily basis.

NOAA’s Big Data strategy is based on making investments in supercomputers, which are used for climate and weather predictions. To ensure that the data is available to the public, NOAA uses various web portals.

Customer-Centric Approach

Expanded technological capabilities allow for a customer-centric approach to providing information. The capability is a follow-through of the information-centric approach. But what is a customer-centric approach? A customer-centric approach is based on the needs and requirements of the customer or user. Big Data will not be effective unless it is pertinent to customers’ needs and reaches them in a manner they can use.

IT has completely revolutionized our society by creating awareness. It is essential that information provided to the user is current and accurate, and it must be consistent across agencies. The customer-centric approach begins with determining customers’ needs, then designing delivery methods available through widely used technologies. The information must be both understandable

and meaningful, and offer a way for users to provide feedback to the agency. These standards hold for both internal agency users and the general public.

Department of Housing and Urban Development

HUD recognizes that users of its data originate in their own agency; the public sphere; and state, local, and tribal governments. Its goal is to make “quality information . . . accessible, current, and accurate at any time.” HUD focuses on inter- and intra-organization coordination

NOAA’s Big Data strategy is based on making investments in supercomputers, which are used for climate and weather predictions.

and researching the customer’s needs. As part of its Big Data strategy and to ensure that it is based on their users, HUD has developed a new online interface, which will allow its users to give feedback on the agency’s performances and services. This tool has been designed to get public opinion, provide a user-friendly experience, and develop strong relations with customers.

Federal Emergency Management Agency

The customer-centric approach is critical to FEMA’s mission to provide relief to the survivors of disasters, and to keep the public and agencies informed. Administrators at all levels of government also must have timely and accurate information to plan for response, recovery, and rebuilding.

An enormous amount of Big Data is pulled together to meet these needs, making the cloud the best solution for storing, organizing, and presenting this information.

National Oceanic and Atmospheric Administration

As the Japanese tsunami event illustrates, weather and the environment are global concerns, and NOAA both gathers and disseminates information on that basis. While its primary mission is to research phenomena that affect the United States, the interdependence of climate in all parts of the world make the Big Data provided by NOAA an international concern. Researchers from around the world can benefit from NOAA’s data, as can the general public.

Shared Platform

A shared platform is considered to be an interface that can be accessed by everyone from any location. Shared platforms are designed to share data at an economical and quick rate. To reach all consumers, regardless of the type of technology they use, data must be “device agnostic,” according to the 2012 White House report on digital government.

To be capable of providing access across various digital platforms, “new tools, applications, systems, websites, and domains” must be—and have been—developed. Public crowdsourcing is one method by which agencies can receive feedback from users as to whether they are able to access data, and whether the data meets their needs. In addition, sharing platforms reduces costs by reducing duplication of efforts within and across agencies.

Department of Housing and Urban Development

HUD takes seriously the White House mandate to innovate with less and uses its increased efficiency to leverage existing services and contracts. HUD gives a prominent place to share technology and data via the HUD user eBookstore (download information) and HUD User Forum (share information and ideas or comment on new developments and research). These shared platforms allow users to download information while protecting the security and privacy of the user and the system.

Federal Emergency Management Agency

FEMA uses the public Amazon Elastic Compute Cloud (EC2) for data creation, discovery, and storage. The agency’s user interface is the Arc GIS Online for Organizations (AGOL), which provides information to the public across a spectrum of devices. Users are able to access both textual information and maps in this manner, allowing them to identify ways in which they may seek relief after a disaster and view maps and satellite images of affected areas. This technology allows the agency to merge their “legacy systems” with newer, more versatile methods of managing the Big Data that is crucial to their operation, according to Rutrell Yasin in his February 13, 2013,

GCN article, “FEMA Seeks to Make Emergency Data Available in Real Time.”

National Oceanic and Atmospheric Administration

The web is a prime source of information for the type of data NOAA provides, although the use of smartphone applications is increasingly important. Consequently, the agency has invested in new supercomputers to store and process data to make available to users. Data is constantly collected from locations around the globe.

Security and Privacy

Security and privacy have been issues since the Internet became widely recognized as a utility. The challenges are critical and constant. Security is vital, but transparency and privacy are equally important. The rights of users must be respected, particularly where personal data is concerned. The use of Big Data must be balanced with the protection of governmental and individual data.

When new technologies become available, security and privacy issues must be addressed immediately and thoroughly. Just as in the private sector, some agency information is proprietary, but if the great majority of data is to be useful to consumers, it must be readily accessible, while still being protected from security breaches and malicious misuse. Standards across agencies must be uniform and consistent to assure the best service to users.

The customer-centric approach begins with determining customers’ needs, then designing delivery methods available through widely used technologies.

Department of Housing and Urban Development

HUD is dedicated to making data transparent and easy for consumers to access while maintaining the security and privacy rights of users. To do this, the department employs “continuous monitoring,” as well as “new solutions in areas such as . . . identity, authentication, . . . and cryptography.” Privacy and security are the main issue in terms of sharing Big Data and for this purpose, HUD concentrates on employing new IT tools to maintain security.

To ensure that its IT systems are reviewed and monitored constantly, HUD follows guidance set by the Federal Information Security Management Act.

Federal Emergency Management Agency

FEMA uses the security measures best adapted to its cloud-oriented data storage system. The agency works to balance Privacy Act restrictions and sensitive government information with parts of its system that operates outside government firewalls.

National Oceanic and Atmospheric Administration

NOAA practices real-time monitoring from a new cybersecurity center. Like other agencies, its goal is to protect data from malicious use, although the type of information it disperses raises fewer concerns about the privacy of users. To further strengthen its security, NOAA has been successful in recruiting more than 115 government employees to monitor IT systems, IT operations, and cybersecurity of these systems.

Provide the Best Information Possible

There are similarities in the ways agencies structure their Big Data collection and dissemination. Each agency strives to meet the criteria put forth by the White House report in varying ways, while tailoring the data structure to meet the needs of their particular missions.

Managers must be aware that Big Data holds major benefits for their customers. They must have the knowledge to use and manage it, with the goal of providing agency decision makers with the best information possible.

Stacey Shindelar serves as a senior program advisor at the Office of Housing, Federal Housing Administration at HUD. She is an adjunct professor focusing on public policy and administration and is pursuing her doctoral studies at the School of Public and International Affairs at Virginia Polytechnic Institute. She can be reached at staceyll@earthblink.net.